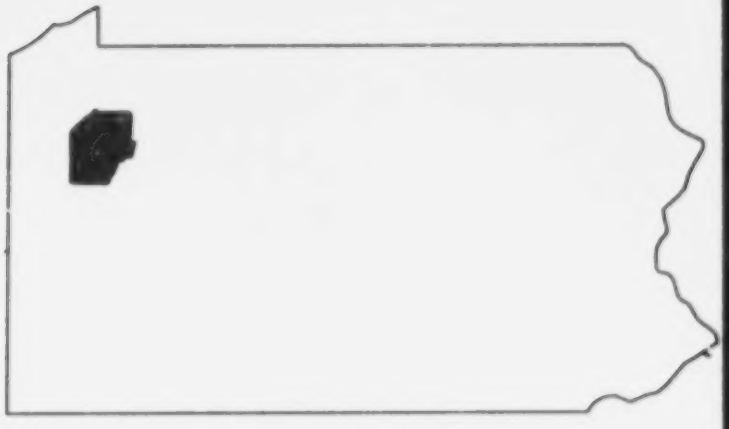
JUL 27 1992

FLOOD INSURANCE STUDY

TOWNSHIP OF ROCKLAND, PENNSYLVANIA
VENANGO COUNTY



OCTOBER 16, 1990

Federal Emergency Management Agency

COMMUNITY NUMBER - 422113

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program (NFIP) have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study (FIS) may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

Part or all of this FIS may be revised and republished at any time. In addition, part of this FIS may be revised by the Letter of Map Revision (LOMR) process, which does not involve republication or redistribution of the FIS. It is, therefore, the responsibility of the user to consult with community officials and to check the community repository to obtain the most current FIS components.

Initial Flood Insurance Study Effective Date: October 16, 1990

Flood Insurance Study Revised:

TABLE OF CONTENTS

		Page
1.0	INTRODUCTION	1
	1.1 Purpose of Study	1
	1.2 Authority and Acknowledgments	1
	1.3 Coordination	1
2.0	AREA STUDIED	2
	2.1 Scope of Study	2
	2.2 Community Description	2
	2.3 Principal Flood Problems	2
	2.4 Flood Protection Measures	4
3.0	ENGINEERING METHODS	5
	3.1 Hydrologic Analyses	5
	3.2 Hydraulic Analyses	6
4.0	FLOODPLAIN MANAGEMENT APPLICATIONS	6
	4.1 Floodplain Boundaries	7
	4.2 Floodways	7
5.0	INSURANCE APPLICATIONS	8
6.0	FLOOD INSURANCE RATE MAP	10
7.0	OTHER STUDIES	10
8.0	LOCATION OF DATA	11
9.0	BIBLIOGRAPHY AND REFERENCES	11

TABLE OF CONTENTS - continued

Page

FIGURES

Figure 1 - Vicinity Map 3

Figure 2 - Floodway Schematic 8

TABLES

Table 1 - Summary of Discharges 6

EXHIBITS

Exhibit 1 - Flood Profiles
Allegheny River Panels 01P-03P

Exhibit 2 - Flood Insurance Rate Map Index and Street Index
Flood Insurance Rate Map

Exhibit 3 - Elevation Reference Marks

FLOOD INSURANCE STUDY
TOWNSHIP OF ROCKLAND, VENANGO COUNTY, PENNSYLVANIA

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the Township of Rockland, Venango County, Pennsylvania, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood risk data for various areas of the community that will be used to establish actuarial flood insurance rates and assist the community in its efforts to promote sound floodplain management. Minimum floodplain management requirements for participation in the National Flood Insurance Program (NFIP) are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the state (or other jurisdictional agency) will be able to explain them.

1.2 Authority and Acknowledgments

The sources of authority for this Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study were prepared by the Pittsburgh District of the U. S. Army Corps of Engineers (COE) during the preparation of a Flood Plain Information report for the Allegheny River, Venango County, Pennsylvania.

1.3 Coordination

On March 31, 1989, the Township of Rockland was notified by the Federal Emergency Management Agency (FEMA) of the initiation of a Flood Insurance Study for the community.

On November 22, 1989, a final Consultation and Coordination Officer's (CCO) meeting was held with representatives of FEMA and the township to review the results of the study.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the Township of Rockland, Venango County, Pennsylvania. The area of study is shown on the Vicinity Map (Figure 1).

The Allegheny River was studied by detailed methods for its entire length within the community. The areas studied by detailed methods were selected with priority given to all known flood hazard areas and areas of projected development and proposed construction.

East Sandy Creek was studied by approximate methods. Approximate analyses were used to study those areas having a low development potential or minimal flood hazards.

2.2 Community Description

The Township of Rockland is located in the south-central portion of Venango County, in northwestern Pennsylvania. It is bordered by the Townships of Cranberry and Sandycreek to the north, the Townships of Richland and Ashland to the east, the Townships of Scrubgrass and Clinton to the south, and the Township of Victory to the west.

The Allegheny River, with a total drainage area of approximately 11,778 square miles at its mouth, joins the Monongahela River to form the Ohio River at the City of Pittsburgh. The headwaters of the Allegheny River are in the western slopes of the Appalachian Mountain Range in Potter County, in northwestern Pennsylvania. The river flows towards the northwest from its source to Portville, New York, near the Pennsylvania State Line. It then flows west to Salamanca, New York, and south to its mouth in Pittsburgh, a total distance of approximately 332 miles.

The Township of Rockland is located in a region of both polar and tropical air-mass activity, and is subject to continental and maritime invasion. The weather is usually moderate, but may have occasional rapid changes resulting from frontal air-mass movements. Temperatures range from an average of 27 degrees Fahrenheit (^{o}F) in February to an average of 71^{o}F in July. Measurable precipitation occurs an average of 149 days per year and amounts to an annual average of 42 inches.

2.3 Principal Flood Problems

Major floods have occurred on the Allegheny River at various times of the year; however, the principal flood season is usually December through April. Most of the floods that occur are the result of

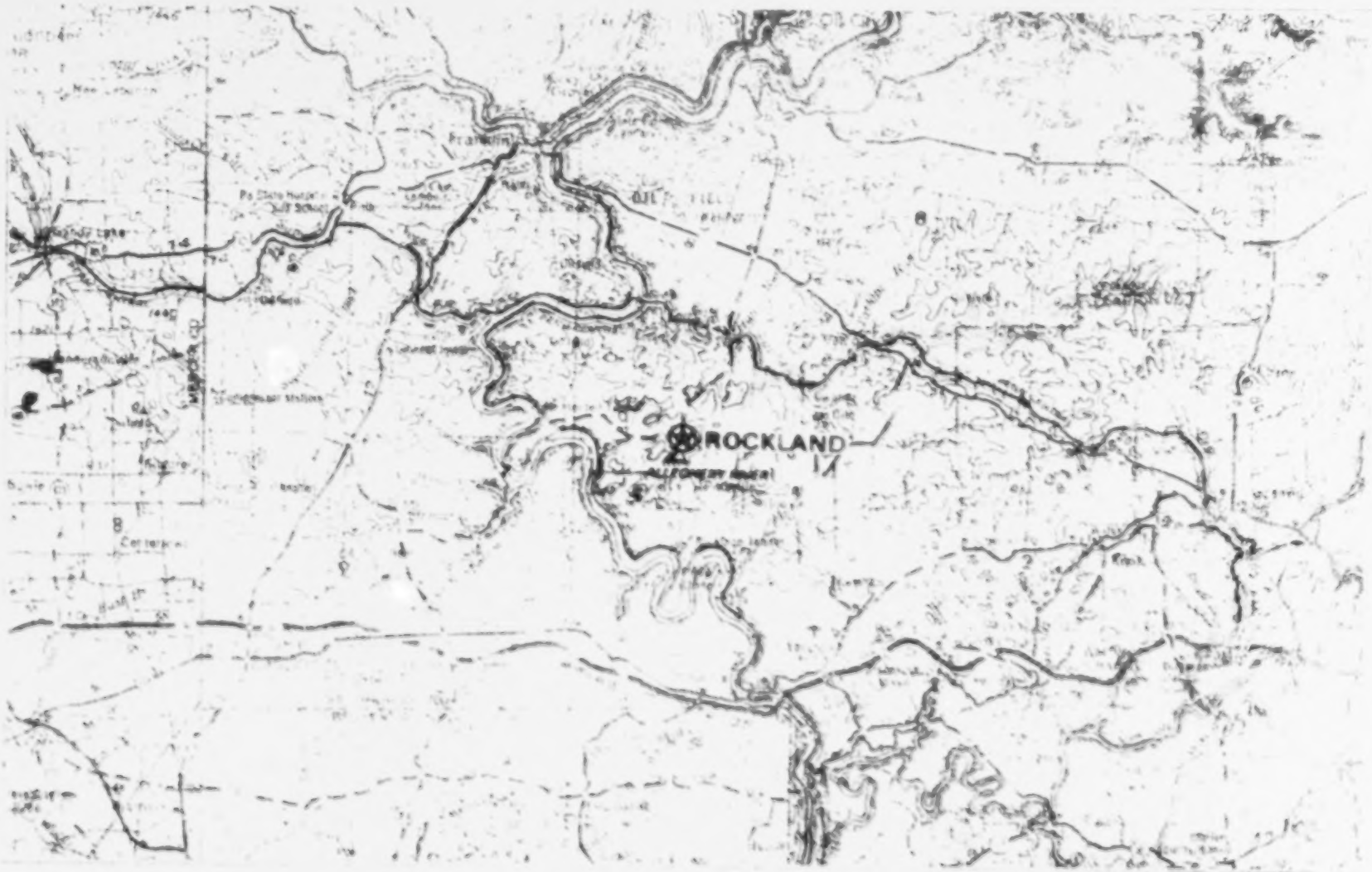


FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWNSHIP OF ROCKLAND, PA

(VENANGO CO.)

APPROXIMATE SCALE

4 0 4 8 12 MILES

VICINITY MAP

heavy rain and snowmelt. It is possible for large floods with a duration of several days to occur at any time of the year. Although summer floods are rare on the Allegheny River, the flood of June 1972 was of considerable magnitude in spite of the reduction by upstream flood control dams and reservoirs. The maximum flood of record on the Allegheny River within the Township of Rockland occurred in March 1865. The most recent flood occurred in June 1972 as a result of Hurricane Agnes. If the present reservoir system had not been in place, the June 1972 flood event would have been approximately 7.5 feet higher than the recorded elevations, and only 1.6 feet lower than the March 1865 flood event. The following tabulation shows major floods on the Allegheny River as measured at U. S. Geological (USGS) gaging station (No. 03025500) located in Franklin, Pennsylvania.

Date of Crest	Actual Stage (feet)	Elevation (feet)	Discharge (cfs)
March 18, 1865	25.0[1]	980.84	196,000
March 26, 1913	24.0	980.44	192,000
March 13, 1920	20.6[2]	976.49	134,000
March 9, 1956	20.5[2]	976.39	133,000
March 22, 1948	20.3[2]	976.20	130,700
March 29, 1914	19.6	975.44	121,500
December 1, 1927	19.4	975.22	119,100
March 29, 1916	19.1[2]	974.94	115,500
April 6, 1947	19.1[2]	974.89	114,900
March 28, 1936	19.0	974.86	114,500

Gage Zero Elevation = 955.84 feet NGVD

[1]Approximated
[2]Includes partial reduction from present reservoir system

2.4 Flood Protection Measures

There are four upstream flood-control dams and reservoirs in the Allegheny River basin that are effective in reducing flood levels in the township. The present reservoir system reduces major flood crests on the Allegheny River by approximately 2.5 to 6 feet. The Tionesta Dam/Tionesta Lake, placed in operation in December 1940, is located approximately 34 miles above the downstream corporate limits and controls a drainage area of approximately 478 square miles. The Kinzua Dam/Allegheny Reservoir, placed in operation in January 1967, is located approximately 79 miles above the downstream corporate limits and controls a drainage area of approximately 2,180 square miles. Union City Dam/Union City Reservoir, placed in operation in October 1970, is located approximately 80 miles above the downstream corporate limits and controls a drainage area of approximately 222 square miles. Woodcock Creek Dam/Woodcock Creek Lake, placed in operaration in January 1974, is located approximately 46 miles above the downstream corporate limits and controls a drainage area of approximately 46 square miles.

3.0 ENGINEERING METHODS

For the flooding source studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude which are expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10, 2, 1, and 0.2 percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (1 percent chance of annual exceedence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for the flooding source studied in detail affecting the community.

Hydrologic analyses were taken from a Flood Plain Information Report for the Allegheny River (Reference 1).

Natural discharge-frequency curves for the Allegheny River were developed following the standard log-Pearson Type III analyses as outlined in USGS Bulletin 17B (Reference 2). The stage discharge records used in the analysis of the Allegheny River were obtained from the USGS gaging station located at Franklin, which covers an 80-year period. The present gaging station is operated jointly by the COE and the USGS. Flood flow frequencies developed at the gaging station were modified by means of an average reduction curve to reflect the reduction caused by the upstream flood control reservoirs.

A summary of the drainage area-peak discharge relationships for the stream studied by detailed methods is shown in Table 1, "Summary of Discharges."

TABLE 1 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
ALLEGHENY RIVER					
Below confluence of French Creek	5,982	84,000	112,000	120,000	157,000

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the source studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1) and the Flood Insurance Rate Map (Exhibit 2) where applicable.

The hydraulic analyses were taken from a Flood Plain Information Report for the Allegheny River (Reference 1). Flood profiles were drawn showing computed water-surface elevations for floods of the selected recurrence intervals.

Channel roughness factors (Manning's "n") used in the hydraulic computations were chosen based on requirements to reproduce profiles for known floods for which high-water marks were obtained and flow quantities were measured or easily calculated. For the Allegheny River, the well-defined flood of June 1972 and the moderate flow of March 1964 were reproduced successfully. For the Allegheny River, channel "n" values ranged from 0.024 to 0.027, and overbank "n" values ranged from 0.021 to 0.075.

The hydraulic analyses for this study were based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

All elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD). Elevation reference marks used in this study are shown on the maps; the descriptions of the marks are presented in Elevation Reference Marks (Exhibit 3).

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The NFIP encourages State and local governments to adopt sound floodplain management programs. Therefore, each Flood Insurance Study provides 100-year flood elevations and delineations of the 100- and 500-year floodplain boundaries to assist communities in developing floodplain management measures.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1 percent annual chance (100-year) flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2 percent annual chance (500-year) flood is employed to indicate additional areas of flood risk in the community. For the stream studied in detail, the 100- and 500-year floodplain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using topographic maps at a scale of 1:4,800 with a contour interval of 4 feet (Reference 3).

For the stream studied by approximate methods, the 100-year floodplain boundaries were delineated using the Flood Hazard Boundary Map for the Township of Rockland (Reference 4).

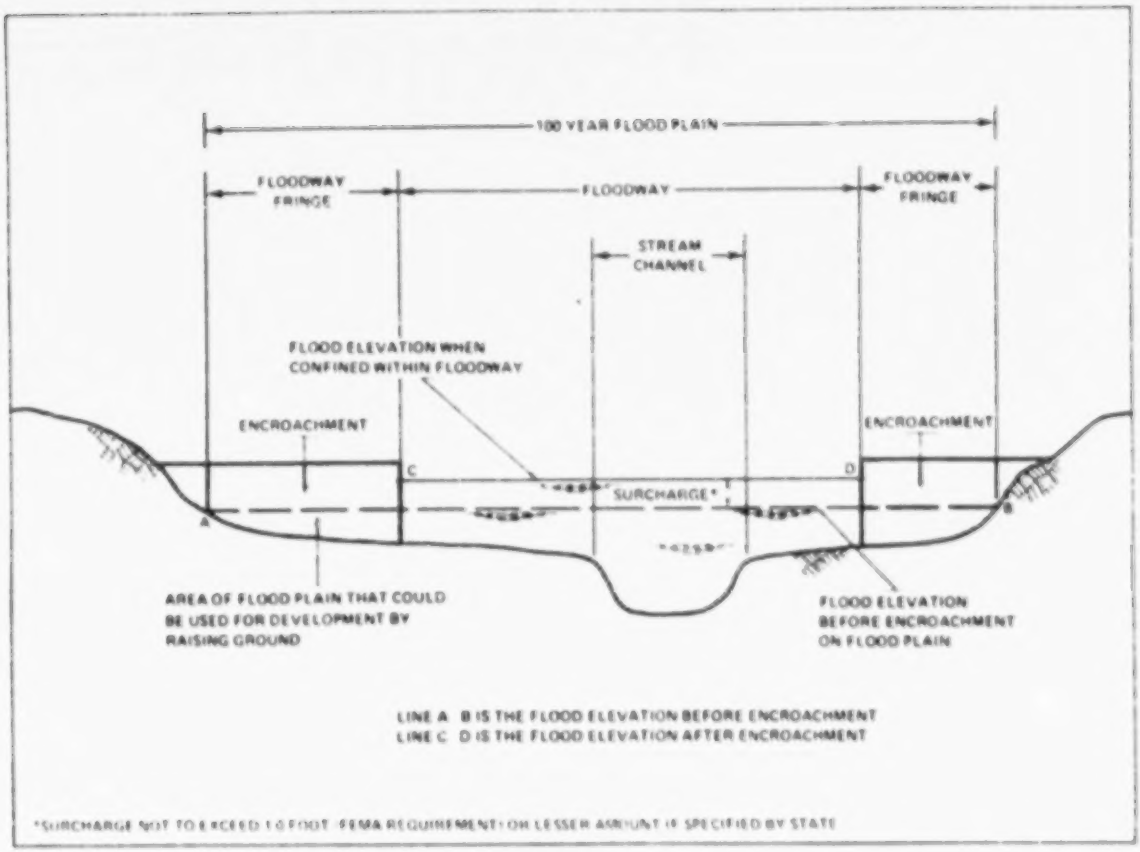
The 100- and 500-year floodplain boundaries are shown on the Flood Insurance Rate Map (Exhibit 2). On this map, the 100-year floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A and AE), and the 500-year floodplain boundary corresponds to the boundary of areas of moderate flood hazards. In cases where the 100- and 500-year floodplain boundaries are close together, only the 100-year floodplain boundary has been shown. Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

4.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 100-year floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment so that the 100-year flood can be carried without substantial increases in flood heights. Minimum federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced.

The area between the floodway and 100-year floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood by more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 2.

Due to the scope of this study, no floodway was calculated for the Allegheny River.


100 YEAR FLOOD PLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
SURCHARGE*
A
B
AREA OF FLOOD PLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOOD PLAIN
LINE A B IS THE FLOOD ELEVATION BEFORE ENCROACHMENT
LINE C D IS THE FLOOD ELEVATION AFTER ENCROACHMENT
*SURCHARGE NOT TO EXCEED 1.0 FOOT - FEMA REQUIREMENT OR LESSER AMOUNT IF SPECIFIED BY STATE

FLOODWAY SCHEMATIC

Figure 2

5.0 INSURANCE APPLICATIONS

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. The zones are as follows:

Zone A

Zone A is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no base flood elevations or depths are shown within this zone.

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by detailed methods. In most instances, whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AH

Zone AH is the flood insurance rate zone that corresponds to the areas of 100-year shallow flooding (usually areas of ponding) where average depths are between 1 and 3 feet. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AO

Zone AO is the flood insurance rate zone that corresponds to the areas of 100-year shallow flooding (usually sheet flow on sloping terrain) where average depths are between 1 and 3 feet. Average whole-depths derived from the detailed hydraulic analyses are shown within this zone.

Zone A99

Zone A99 is the flood insurance rate zone that corresponds to areas of the 100-year floodplain that will be protected by a Federal flood protection system where construction has reached specified statutory milestones. No base flood elevations or depths are shown within this zone.

Zone V

Zone V is the flood insurance rate zone that corresponds to the 100-year coastal floodplains that have additional hazards associated with storm waves. Because approximate hydraulic analyses are performed for such areas, no base flood elevations are shown within this zone.

Zone VE

Zone VE is the flood insurance rate zone that corresponds to the 100-year coastal floodplains that have additional hazards associated with storm waves. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 500-year floodplain, areas within the 500-year floodplain, and to areas of 100-year flooding where average depths are less than 1 foot, areas of 100-year flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 100-year flood by levees. No base flood elevations or depths are shown within this zone.

Zone D

Zone D is the flood insurance rate zone that corresponds to unstudied areas where flood hazards are undetermined, but possible.

6.0 FLOOD INSURANCE RATE MAP

The Flood Insurance Rate Map is designed for flood insurance and floodplain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 100-year floodplains that were studied by detailed methods, shows selected whole-foot base flood elevations or average depths. Insurance agents use the zones and base flood elevations in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols, the 100 and 500-year floodplains. The locations of selected cross sections used in the hydraulic analyses are shown where applicable.

7.0 OTHER STUDIES

A Flood Plain Information Report for Venango County, Pennsylvania has been prepared by the COE (Reference 1). That report concerns flooding of the Allegheny River.

A Flood Insurance Study is currently being prepared for the Township of Scrubgrass (Reference 5). The results of that study will be in exact agreement with the results of this study.

Flood Insurance Studies have been prepared for the Townships of Sandycreek, Cranberry, Victory, and Clinton (References 6, 7, 8, and 9). The results of this study, because they are based on more detailed analyses, are not in exact agreement with the results of those studies.

8.0 LOCATION OF DATA

Information concerning the pertinent data used in preparation of this study can be obtained by contacting FEMA, the Natural and Technological Hazards Division, Liberty Square Building (Second Floor), 105 South Seventh Street, Philadelphia, Pennsylvania 19106.

9.0 BIBLIOGRAPHY AND REFERENCES

1. U. S. Army Corps of Engineers, Pittsburgh District, Flood Plain Information, Allegheny River, Venango County, Pennsylvania, Pittsburgh, Pennsylvania, 1974.

2. U. S. Department of the Interior, Geological Survey, Office of Water Data Collection, Interagency Advisory Committee on Water Data, "Guidelines for Determining Flood Flow Frequency," Bulletin 17B, Reston, Virginia, Revised September 1981.

3. Michael Baker, Jr., Inc., Topographic Maps Compiled from Aerial Photographs, Scale 1:4,800, Contour Interval 4 Feet: Beaver, Pennsylvania, February 1984.

4. U. S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, Township of Rockland, Venango County, Pennsylvania, October 12, 1979.

5. Federal Emergency Management Agency, Flood Insurance Study, Township of Scrubgrass, Venango County, Pennsylvania (Unpublished).

6. Federal Emergency Management Agency, Flood Insurance Study, Township of Sandycreek, Venango County, Pennsylvania, Washington, D. C., October 16, 1990.

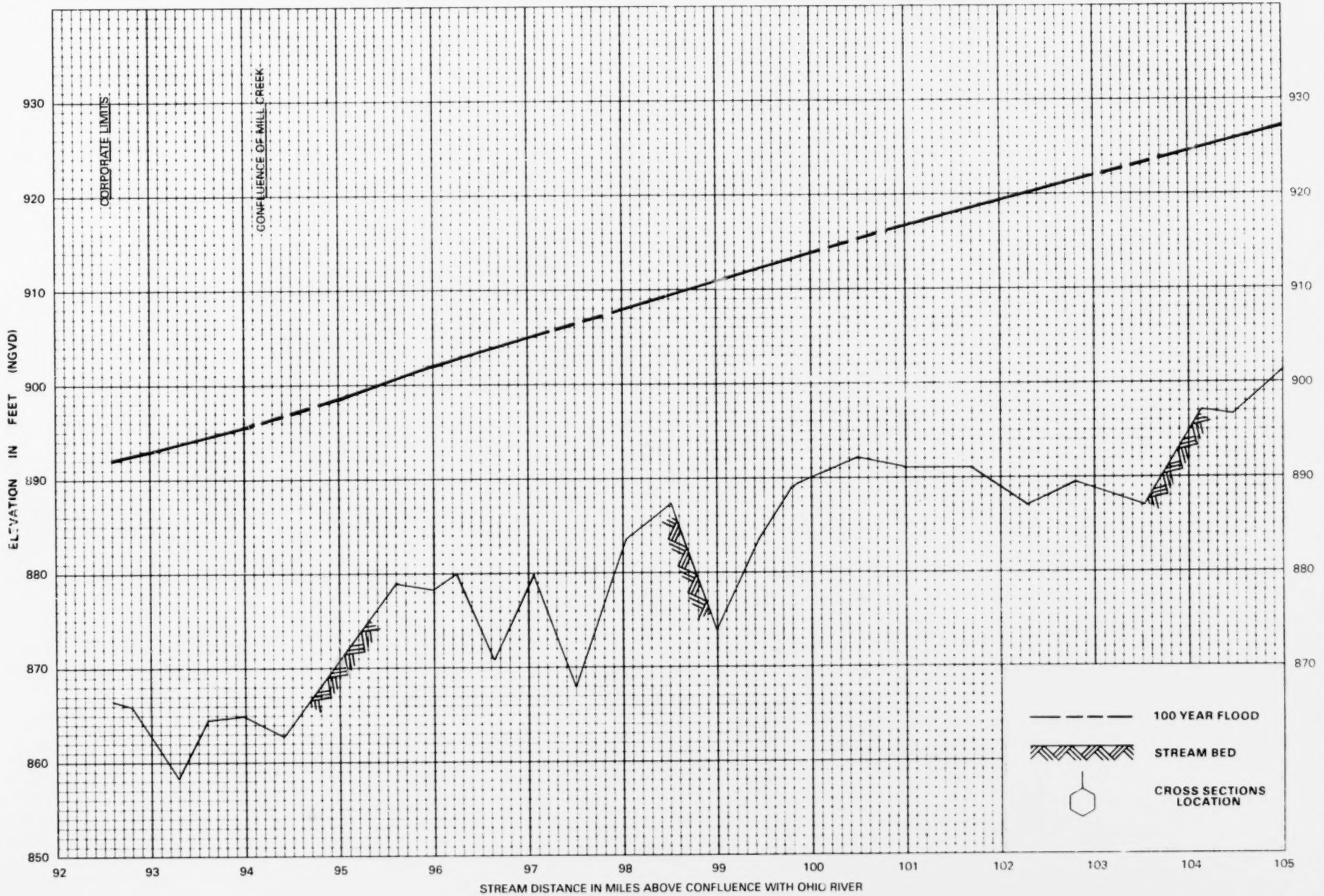
7. Federal Emergency Management Agency, Flood Insurance Study, Township of Cranberry, Venango County, Pennsylvania, Washington, D. C., April 5, 1988.

8. Federal Emergency Management Agency, Flood Insurance Study, Township of Victory, Venango County, Pennsylvania, Washington, D. C., September 24, 1984.

9. Federal Emergency Management Agency, Flood Insurance Study, Township of Clinton, Venango County, Pennsylvania, Washington, D. C., September 10, 1984.

EXHIBIT 3 - ELEVATION REFERENCE MARKS

Reference Mark	FIRM Panel	Elevation (Feet NGVD)	Description of Location
RM 1	25	906.22	Standard tablet, stamped 905 Pittsburg 1899, at northwest abutment of bridge No. 92.4, approximately 3.2 miles northwest of station along CONRAIL, approximately 0.1 mile north of Dotter; tablet is approximately six feet southwest of southwest rail, and approximately six feet lower than track in southwest end of bridge seat.



FLOOD PROFILES

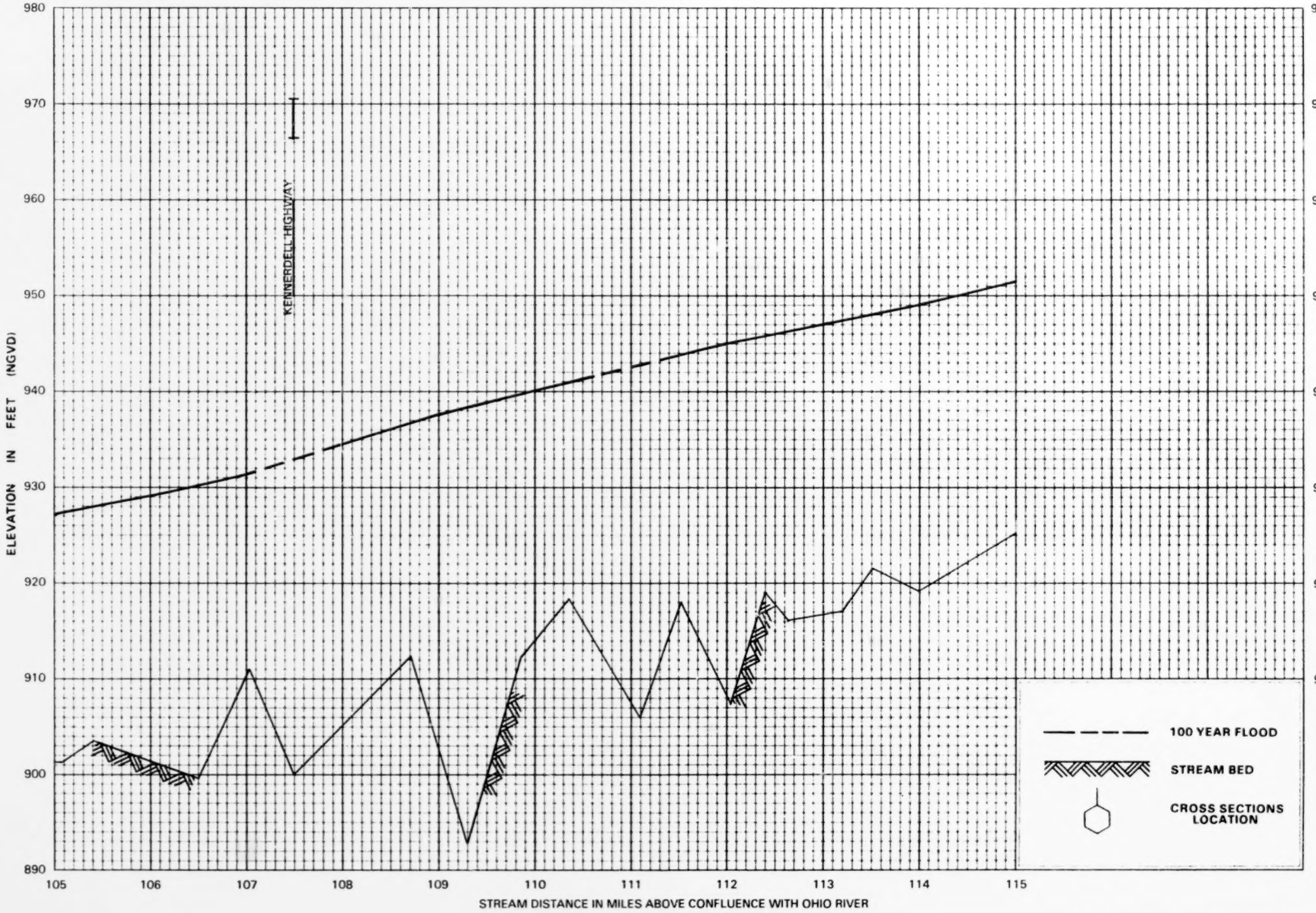
ALLEGHENY RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWNSHIP OF ROCKLAND, PA

(VENANGO CO.)

01P



FLOOD PROFILES

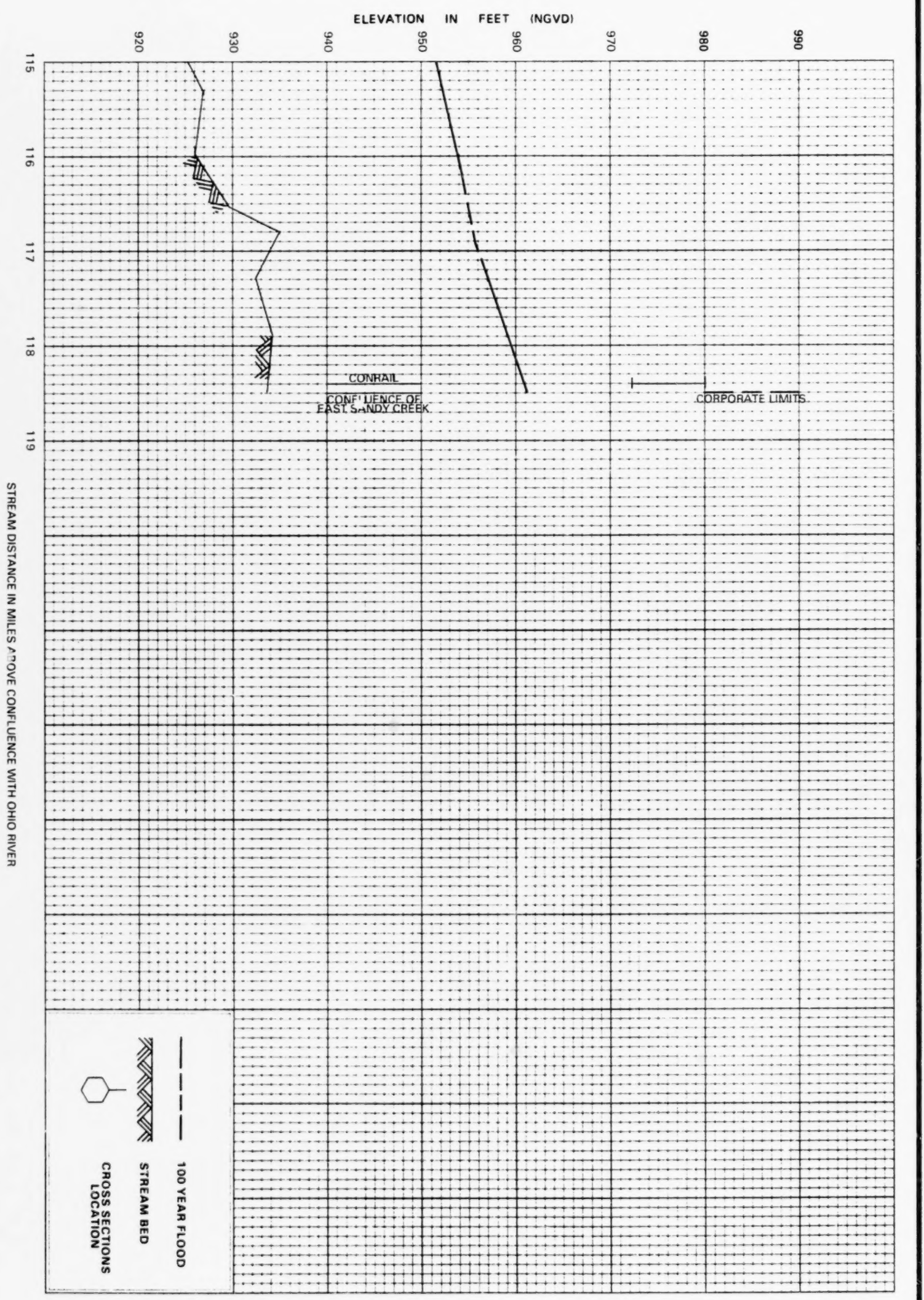
ALLEGHENY RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWNSHIP OF ROCKLAND, PA

(VENANGO CO.)

02P



03P	FEDERAL EMERGENCY MANAGEMENT AGENCY **TOWNSHIP OF ROCKLAND, PA** (VENANGO CO.)	**FLOOD PROFILES** **ALLEGHENY RIVER**